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Teachers as Healthy Beverage Role Models: Relationship of Student and Teacher Beverage Choices in Elementary Schools

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Abstract

Schools are a key setting for curbing student intake of sugar-sweetened beverages (SSBs). While studies suggest that restrictions on SSBs, increased access to healthier beverages, and education about the importance of drinking water instead of SSBs can promote healthier beverage patterns among students, there is little known about the impact that teachers' own beverage choices can have on those of their students. Data were drawn from cross-sectional surveys administered as part of a larger evaluation of a drinking water access and promotion intervention in public elementary schools in the San Francisco Bay Area region of California. Descriptive statistics were used to examine teacher ($n = 56$) and student ($n = 1176$) self-reported beverage consumption at school. Mixed-effects logistic regression was used to examine associations between teacher and student beverage intake adjusting for clustering of students by teacher. Teachers were also surveyed via open-ended questions about strategies to increase student water consumption at school. Nearly all teachers reported drinking water during the school day (95%), often in front of students. Teacher SSB intake was rare (9%). Students whose teachers drank water in front of their classes were significantly more likely to report drinking water during the school day. Teachers tend to select healthy beverages at work and may serve as role models to encourage student consumption of water instead of SSBs.

Keywords Sugar-sweetened beverages · Teachers · Students · School nutrition · Drinking water

Introduction

Sugar-sweetened beverages (SSBs), such as soda, juice blends, and sports drinks with added sugar, have been consistently implicated as a contributor to childhood obesity and dental caries [1–3]. Schools increasingly have limited sales of SSBs in cafeterias, vending machines, and competitive

food outlets, and these policies have led to decreases in student SSB intake [4, 5]. Parents and peers can also influence students' SSB intake. Parental modeling of healthy beverage consumption can promote healthy beverage choices among children [6]. In contrast, youth who perceive that their peers drink SSBs consume more SSBs themselves [7]. Peer influence interventions designed to increase intake of water in lieu of SSBs have successfully promoted healthy beverage choices among students [8].

There is less published research, however, about teachers' role in influencing student beverage choices, and most of this literature focuses on didactic nutrition education that teachers provide. A British teacher-led school educational program to reduce intake of SSBs decreased soda consumption and increased water intake among elementary school students [9]. In a German elementary school study, installation of water dispensers coupled with teachers' delivery of a water promotion curricula and encouragement of students to fill up reusable water bottles, led to increases in student water intake with a modest decrease in SSB consumption [10].

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In addition to their role in delivering nutrition education, teachers may also shape student health behaviors through their own health practices, particularly when observed by students. In high schools in Spain, teacher smoking at school was associated with student smoking behavior [11]. Teachers in China with greater health knowledge and protective health behaviors related to chronic disease prevention had students who were less likely to drink SSBs; the study, however, did not specifically assess teachers' SSB intake [12].

While teachers' beverage intake may influence student consumption of beverages, to our knowledge, no study has explored this question. There is also limited published information about teachers' beverage intake patterns in schools. In a study of Midwestern middle school teachers, nearly 2 in 3 teachers purchased SSBs from campus vending machines [13]. A survey of elementary and middle-school teachers in rural Oregon found that almost half of teachers drank SSBs in the classroom [14].

In the current study, we sought to add to this literature by investigating elementary school teachers' beverage intake at school and how such consumption relates to that of their students. We also asked teachers about their ideas for promoting intake of water in school settings.

Materials and Methods

Participants

This study analyzes cross-sectional data from a larger, quasi-experimental evaluation of a water access and promotion intervention involving 19 low-income public elementary schools in three different school districts in Santa Clara County, California. Between October 2014 and June 2015, 10 schools received reusable water bottle refilling stations and water promotion interventions, while 9 control schools received no water-related interventions. Data analyzed for this study included post-intervention surveys administered to both 3rd grade students and their teachers.

Eligible students included all 3rd grade students at study schools who were able to read and write in English or Spanish. As this study was of minimal risk and could not be practicably completed without a waiver or alteration of consent, an implied consent process was used in which parents contacted the study team if they did not want their child to participate or had questions about the study. The study team employed multiple methods (flyers home, emails, school website postings) separated by at least 5 days, to ensure that parents received information about the study and the means to opt out. Students with implied parental consent were also asked to provide written assent prior to participation. All students received a mechanical pencil for their participation in the study. All 3rd grade teachers at the study sites were

eligible for teacher surveys and provided written informed consent prior to participation. Teachers received \$10 gift cards for study participation. The Institutional Review Board at the University of California, San Francisco approved this study.

Instrument

The student survey was adapted from a previously validated beverage survey, pilot tested with teachers and students at an ineligible school, and revised prior to use [15]. Survey questions assessed intake of beverages on a single school day including: intake of tap and bottled waters from various sources, plain white milk, strawberry or chocolate sugar-sweetened milk, 100% fruit juice, Capri Sun, soda, and 'other' drinks. Questions asked, "At school, did you drink [beverage]?" If the student answered yes, he/she was asked, "If you answered yes, how much [beverage] did you drink?" Response options were: just a sip or two, a quarter of a bottle or can, half of a bottle or a can, one bottle or can, or two or more bottles or cans. All beverage type and quantity response options were presented both in words and in pictures to facilitate comprehension. The primary outcome variable, student water consumption, was a binary yes/no composite variable that included consumption of water from any of the following sources: (1) water fountain, (2) reusable water bottle filling station, (3) water jug or dispenser, (4) single-use bottled water or (5) reusable water bottle. SSB was categorized as any consumption of sodas, smoothies, sports drinks, or 'other' beverages classified as a drink with added sugar. Capri-Sun was considered as a separate category as some varieties are 100% juice while others are SSBs. As is convention in most studies, flavored milk was not classified as a SSB [16].

The teacher survey items mimic those on the student survey, but included additional beverages that adults more commonly drink, such as coffee, tea, or flavored bottled waters. Coffee with added sugar was not considered a SSB as it would be difficult for students to distinguish whether teachers were drinking sweetened or unsweetened coffee. If teachers reported consuming a particular beverage, they were asked if they consumed the beverage while visible to students. Teachers were also asked open-ended questions regarding strategies to encourage students to drink more water at school.

Procedure

The water intervention was aimed at increasing water consumption by improving access to fresh drinking water. All intervention schools received one reusable water bottle refilling station in the cafeteria and reusable water bottles to distribute to all students. No changes were made to the

classroom environment. We did not have information about whether teachers had access to beverage vending machines in teacher lounges. Intervention schools were also offered a “Potter the Otter—A Tale about Water” educational puppet show performance and picture book about the health benefits of drinking water instead of sugary drinks and juices [17]. 100% fruit juice and flavored milk were available to students in the cafeteria at designated mealtimes. SSBs were not available for purchase by students at any study school.

In order to capture the majority of beverages consumed at school, both student and teacher surveys were administered after lunchtime close to the end of the school day. Researchers verbally administered surveys to students. Teachers completed surveys independently. Survey response rate was 95% for teachers; 3 teachers (2 control, 1 intervention) were absent during data collection.

Statistical Analysis

Demographic characteristics and differences in beverage consumption by intervention and control schools were compared using Student's t-test and chi-square tests. Mixed-effects logistic regression was used to examine associations between student and teacher beverage intake, accounting for clustering of students by teacher. Brief responses to open-ended items on the teacher questionnaire were analyzed for common themes. Statistical analyses were performed using Stata 11.

Results

Table 1 presents demographic characteristics of the 56 3rd grade teachers and their 1,176 students. A majority of teachers were female. Most students were 8 or 9 years old and a majority spoke a language other than English at home. There were no significant demographic differences between teachers and students at intervention and control sites (Table 1).

Next, we examined what beverages teachers reported consuming at school, both visible and not visible to students (Table 2). Teachers drank similar beverages during the school day at intervention and control schools. Nearly all (> 90%) teachers drank water during the school day, and slightly more than half drank water in front of students. Overall SSB consumption was low: teachers reported drinking hot chocolate, sparkling soda, and smoothies. Two teachers reported drinking diet soda, while none reported drinking non-diet soda or sports drinks. Only one teacher reported drinking SSBs (other than sweetened tea or coffee) in front of students. Teachers often drank coffee, both with and without added sugar, in front of students. In sensitivity analysis, in which coffee with added sugar was classified as a SSB, results were not significantly different.

Compared to students at control schools, students at intervention schools were more likely to drink juice and flavored milk, and less likely to drink Capri-Sun or to drink no beverages throughout the day (Table 2). Notably, at one control site, flavored milk was not sold on the study day and so no children drank that beverage on that day. There was no significant difference in student water consumption between students at intervention and control schools. Students who drank 100% fruit juice and regular milk were more likely to drink water. Student SSB and flavored milk consumption were not significantly related to water drinking.

In adjusted analyses, accounting for clustering of students in the teacher's classroom, teachers who reported drinking water in front of their students were more likely to have students who drank water (Table 3). However, visible teacher SSB consumption was not associated with student SSB consumption.

Open-ended surveys of teachers regarding recommendations to increase student water consumption yielded four key themes: increasing access to appealing drinking water, educating students about the benefits of water, providing or allowing students to have water bottles or other drinking vessels in school, and changing school policies around classroom water access and increased bathroom breaks (Table 4). Of note,

Table 1 Characteristics of teachers and students in study schools by water access/promotion intervention status

Teachers (n = 56)	Intervention n = 33 n (%)	Control n = 23 n (%)
Age (years)		
18–34	6 (18)	6 (26)
35–44	11 (33)	8 (35)
45–54	10 (30)	5 (22)
55–75	6 (18)	4 (17)
Female gender	25 (76)	18 (78)
Students (n = 1176)	Intervention n = 665 n (%)	Control n = 511 n (%)
Age (years)		
7	2 (0.2)	3 (0.1)
8	330 (50)	243 (48)
9	311 (47)	253 (50)
10	19 (3)	7 (1)
Female gender	321 (48)	251 (49)
Languages spoken at home		
English	141 (21)	128 (25)
Spanish	429 (64)	233 (46)
Vietnamese	53 (8)	76 (14)
Other	41 (6)	74 (14)

There were no significant differences between students or teachers at intervention and control schools

Table 2 Proportion of teachers and students consuming beverages at school by water access/promotion intervention status

Teacher consumption	Intervention n = 33 n (%)	Control n = 23 n (%)	p-value
Water	31 (94)	22 (96)	1.000
Visible water	18 (55)	13 (57)	0.884
SSB	3 (9)	2 (9)	1.000
Visible SSB	1 (3)	0 (0)	1.000
100% fruit juice	4 (12)	3 (13)	1.000
Visible fruit juice	1 (3)	0 (0)	1.000
Plain milk	0 (0)	2 (9)	0.164
Flavored milk	0 (0)	0 (0)	1.000
Coffee with sugar	9 (27)	5 (22)	0.760
Visible coffee with sugar	6 (18)	5 (22)	0.746
Unsweetened coffee	8 (24)	6 (26)	0.875
Visible unsweetened coffee	6 (18)	6 (26)	0.478
Nothing to drink	0 (0)	0 (0)	1.000
Student consumption	Intervention n = 665 n (%)	Control n = 511 n (%)	p-value
Water	592 (89)	449 (88)	0.538
SSB	49 (7)	47 (9)	0.256
Juice	228 (34)	95 (19)	0.001
Capri-Sun	48 (7)	61 (12)	0.004
Milk	260 (39)	206 (40)	0.683
Flavored milk	365 (55)	140 (28)	0.000
Nothing to drink	13 (2)	23 (5)	0.012

only 2 of 56 teachers suggested that teachers' role modeling of water consumption could help encourage students to drink more water. Teachers at control schools frequently recommended increasing the number of water fountains and allowing water bottles at school, which were both features of the water intervention. Teachers at intervention schools, where water stations were installed in cafeterias where they were inaccessible outside of lunch hours, recommended increasing access to water in other key school locations for easy access throughout the day. One teacher also noted that changes to the school's bathroom policy might be needed to allow for increased bathroom breaks resulting from improved student hydration.

Discussion

Recent legislation at both the state and national level has required schools to provide access to free drinking water in school food service areas where meals are served and/or eaten [18]. While improving drinking water access environments in schools is a positive step toward increasing students' water intake in schools, it is also important to promote drinking water as a beverage of choice [19].

Adults who role model drinking water is one strategy to promote water intake among students. In this study, students whose teachers drank water in front of them were more likely to drink water at school. We also found that most teachers drank water during the school day and limited consumption of SSBs. While our estimates of teacher water consumption are similar to those from other studies, SSB consumption was much lower than reported in prior studies [13, 14]. This may be due to the fact that previous studies assessed SSB intake of teachers in middle schools that have greater access to SSBs than elementary schools, the focus of our study [14]. Another possibility is that studies used different definitions of SSBs. In our study, we observed high rates of coffee consumption, both with and without added sugars, but did not include coffee in our measure of SSBs. Previous studies, however, did not specify whether coffee with sugar was classified as an SSB [13, 14].

In this study, we found that students who drank 100% juice and plain milk at school were more likely to drink water during the school day. This finding is consistent with previous research demonstrating a positive relationship between water intake and consumption of dairy [20]. Such findings suggest that consumption of beverages such as milk,

Table 3 Factors associated with student water consumption

Student factors	Reported water consumption n (%)	OR (95% CI)	p-value
Age (years)			
7	4 (80)	1 [Reference]	
8	495 (86)	1.92 (0.2–17.6)	0.57
9	480 (85)	1.90 (0.2–17.4)	0.57
10	21 (81)	1.31 (0.1–15.1)	0.83
Sex			
Male	525 (87)	1 [Reference]	
Female	513 (90)	1.46 (0.9–2.3)	0.12
Language spoken at home			
English	235 (87)	1 [Reference]	
Spanish (most or half)	588 (88)	1.17 (0.8–1.8)	0.49
Vietnamese (most or half)	114 (88)	1.22 (0.6–2.4)	0.55
Other	104 (90)	1.37 (0.7–2.8)	0.38
Student beverage consumption			
SSB	651 (89)	1.2 (0.8–1.8)	0.36
Juice	296 (91)	1.8 (1.1–3.0)	0.02
Milk	443 (95)	3.7 (2.3–6.0)	<0.001
Flavored milk	453 (89)	1.2 (0.8–1.9)	0.29
Visible teacher consumption			
SSB	202 (87)	0.8 (0.4–1.5)	0.44
Water	483 (91)	1.8 (1.1–3.1)	0.03

100% fruit juice, and water tend to cluster together and may be markers of a healthier overall dietary pattern [21].

To our knowledge, this study is one of the first to examine teachers' ideas for encouraging water consumption among students in school settings. Although our study suggests that teachers who role model drinking water may positively impact students' water consumption, few teachers noted this as a strategy for promoting healthy hydration among students. Instead, teachers commonly referenced environmental supports such as installation of reusable water bottle filling stations and distribution of reusable water bottles for students. Other notable suggestions included teaching didactic lessons about the importance of drinking water, ensuring that water stations are installed in locations where they are accessible to students throughout the day, and implementing school policies to support healthy beverage consumption, such as allowing water consumption during class, relaxing rules around restroom use, and improving healthfulness of beverages at school.

Limitations

The beverage recall survey used in this study, while modified from a validated survey and pilot tested in this setting, has not been validated. Moreover, self-reported dietary information is less comprehensive as compared to observation or plate waste methods [22]. Additionally, while the San Francisco Bay Area and California as a whole have had well-established healthy beverage standards since 2005, findings may not reflect other regions of the country. However, given

Table 4 Teachers' suggested strategies to increase student water consumption at school

Theme	Illustrative quotes
Access	
Increasing number of fountains	"More water fountains. Fountains that have large water flow"
Placing fountain outside	"I would move [the drinking station] outside, students could fill their bottles up at recess and bring them into class. Students would drink more at recess"
Access to water at all times	"Students should be allowed to drink water whenever needed. For example, after recess or lunch break etc"
Water promotion	
School-wide	"All staff encourage students to drink water during recess, lunch, before and after school"
Didactic lessons	"Do a class lesson about the importance of staying hydrated and using reusable bottles"
Teacher role modeling	"I think making sure that I drink water all the time in front of students"
Teacher reminders or rewards	"Reminding students and perhaps giving out certificates for making healthy choices"
Water bottles	
School providing bottles	"Provide reusable water bottles"
Allowing bottles/cups in classroom	"Bring their own reusable water bottles and use it in the classroom"
Policy change	
Types of beverages allowed	"Get rid of chocolate milk. More education about what a sugary drink really is"
Bathroom policy	"Stop punishing kids for using the bathroom during class"

that federal Smart Snacks in School standards, which mirror California beverage policies and limit portion size of milk and 100% juices while preventing sale of SSBs at the elementary school level, were implemented in School Year 2014–2015, beverage environments in the majority of U.S. schools currently resemble those in this study [23].

Conclusions

In this study of elementary schools in the San Francisco Bay Area, teachers' role modeling of water intake was linked to students' water consumption. Future efforts to promote students' intake of water in schools should not only consider environmental factors and policy levers, but should also include efforts to support teachers so that they can role model healthy hydration for students.

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Compliance with Ethical Standards

Conflict of interest The authors state that they have no conflict of interest.

Ethical Approval This study was approved by the University of California, San Francisco Committee on Human Research. The Human Subjects Approval Number is 14-14795.

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